

# Together We Make It Safe!



## Transient Voltage Suppressor (TVS)





## Transient Voltage Suppressor (TVS) SMCJ

- Surface Mount
- 1500W

### Features

- Glass Passivated Chip
- Uni and Bidirectional Unit
- Low Leakage
- Excellent clamping capability
- Fast response time
- AEC-Q101 qualified
- Plastic material U/L 94V-0 recognized
- Reverse Voltage - 5.0 to 440 V
- Power Dissipation - 1500 W

### Applications

- Automotive Electronics
- Telecom
- Lightning Protection Module
- Security Switching Power Supply
- Industrial Controller
- Inverter
- Renewable Energy Solar/Wind

## Maximum Ratings and Thermal Characteristics

| Parameter                                                                                         | Symbol      | Value   | Unit             |
|---------------------------------------------------------------------------------------------------|-------------|---------|------------------|
| Peak Power Dissipation At $T_A = 25^\circ\text{C}$ $T_p=10/1000\mu\text{s}$ Waveform <sup>3</sup> | $P_{PK}$    | 1500    | W                |
| Power Dissipation on Infinite Heat Sink at $T_A=50^\circ\text{C}$ <sup>4</sup>                    | $P_{M(AV)}$ | 6.5     | W                |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave <sup>5</sup>                              | $I_F$       | 200     | A                |
| Maximum Instantaneous forward voltage at 25A for unidirectional devices only <sup>6</sup>         | $V_F$       | 3.5/5.0 | V                |
| Storage Temperature Range                                                                         | $T_{STG}$   | -50~150 | $^\circ\text{C}$ |
| Operating Junction Temperature Range                                                              | $T_J$       | -50~150 | $^\circ\text{C}$ |

Note:

1. Ratings at  $25^\circ\text{C}$  ambient temperature unless otherwise specified.
2. Single phase, half wave, 60Hz, resistive or inductive load.
3. Non-repetitive current pulse@10/1000 $\mu\text{s}$  and derated above  $T_A=25^\circ\text{C}$
4. Mounted on 5.0x5.0mm copper pad to each terminal.
5. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only.
6.  $V_F < 3.5\text{V}$  for  $V_{BR} \leq 200\text{V}$  and  $V_F < 6.5\text{V}$  for  $V_{BR} \geq 201\text{V}$ .

## Product Identification

SMCJ   XXX   A or CA  
(1)   (2)   (3)   (4)

(1) Product Code   (2) Reverse Standoff Voltage  $V_{RM}$    (3) Unidirectional   (4) Bidirectional

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### Electrical Characteristics

| Part Number |           | Part Marking |     | $V_{BR}^{(1)}$ @ $I_T$ |        | $I_T^{(2)}$ | $V_{RM}^{(3)}$ | $Max I_R^{(4)}$<br>@ $V_{RM}$ | $Max V_C^{(5)}$ | $Max I_{PP}^{(6)}$ |
|-------------|-----------|--------------|-----|------------------------|--------|-------------|----------------|-------------------------------|-----------------|--------------------|
| Uni         | Bi        | Uni          | Bi  | MIN(V)                 | MAX(V) | mA          | V              | μA                            | V               | A                  |
| SMCJ5.0A    | SMCJ5.0CA | GDE          | BDE | 6.4                    | 7.07   | 10          | 5              | 800                           | 9.2             | 163                |
| SMCJ6.0A    | SMCJ6.0CA | GDG          | BDG | 6.67                   | 7.37   | 10          | 6              | 800                           | 10.3            | 145.6              |
| SMCJ6.5A    | SMCJ6.5CA | GDK          | BDK | 7.22                   | 7.98   | 10          | 6.5            | 500                           | 11.2            | 133.9              |
| SMCJ7.0A    | SMCJ7.0CA | GDM          | BDM | 7.78                   | 8.6    | 10          | 7              | 200                           | 12              | 125                |
| SMCJ7.5A    | SMCJ7.5CA | GDP          | BDP | 8.33                   | 9.21   | 1           | 7.5            | 100                           | 12.9            | 116.3              |
| SMCJ8.0A    | SMCJ8.0CA | GDR          | BDR | 8.89                   | 9.83   | 1           | 8              | 50                            | 13.6            | 110.3              |
| SMCJ8.5A    | SMCJ8.5CA | GDT          | BDT | 9.44                   | 10.4   | 1           | 8.5            | 20                            | 14.4            | 104.2              |
| SMCJ9.0A    | SMCJ9.0CA | GDV          | BDV | 10                     | 11.1   | 1           | 9              | 10                            | 15.4            | 97.4               |
| SMCJ10A     | SMCJ10CA  | GDX          | BDX | 11.1                   | 12.3   | 1           | 10             | 5                             | 17              | 88.2               |
| SMCJ11A     | SMCJ11CA  | GDZ          | BDZ | 12.2                   | 13.5   | 1           | 11             | 1                             | 18.2            | 82.4               |
| SMCJ12A     | SMCJ12CA  | GEE          | BEE | 13.3                   | 14.7   | 1           | 12             | 1                             | 19.9            | 75.4               |
| SMCJ13A     | SMCJ13CA  | GEG          | BEG | 14.4                   | 15.9   | 1           | 13             | 1                             | 21.5            | 69.8               |
| SMCJ14A     | SMCJ14CA  | GEK          | BEK | 15.6                   | 17.2   | 1           | 14             | 1                             | 23.2            | 64.7               |
| SMCJ15A     | SMCJ15CA  | GEM          | BEM | 16.7                   | 18.5   | 1           | 15             | 1                             | 24.4            | 61.5               |
| SMCJ16A     | SMCJ16CA  | GEP          | BEP | 17.8                   | 19.7   | 1           | 16             | 1                             | 26              | 57.7               |
| SMCJ17A     | SMCJ17CA  | GER          | BER | 18.9                   | 20.9   | 1           | 17             | 1                             | 27.6            | 54.3               |
| SMCJ18A     | SMCJ18CA  | GET          | BET | 20                     | 22.1   | 1           | 18             | 1                             | 29.2            | 51.4               |
| SMCJ20A     | SMCJ20CA  | GEV          | BEV | 22.2                   | 24.5   | 1           | 20             | 1                             | 32.4            | 46.3               |
| SMCJ22A     | SMCJ22CA  | GEX          | BEX | 24.4                   | 27     | 1           | 22             | 1                             | 35.5            | 42.3               |
| SMCJ24A     | SMCJ24CA  | GEZ          | BEZ | 26.7                   | 29.5   | 1           | 24             | 1                             | 38.9            | 38.6               |
| SMCJ26A     | SMCJ26CA  | GFE          | BFE | 28.9                   | 31.9   | 1           | 26             | 1                             | 42.1            | 35.6               |
| SMCJ28A     | SMCJ28CA  | GFG          | BFG | 31.1                   | 34.4   | 1           | 28             | 1                             | 45.4            | 33                 |
| SMCJ30A     | SMCJ30CA  | GFK          | BFK | 33.3                   | 36.8   | 1           | 30             | 1                             | 48.4            | 31                 |
| SMCJ33A     | SMCJ33CA  | GFM          | BFM | 36.7                   | 40.6   | 1           | 33             | 1                             | 53.3            | 28.1               |
| SMCJ36A     | SMCJ36CA  | GFP          | BFP | 40                     | 44.2   | 1           | 36             | 1                             | 58.1            | 25.8               |
| SMCJ40A     | SMCJ40CA  | GFR          | BFR | 44.4                   | 49.1   | 1           | 40             | 1                             | 64.5            | 23.3               |
| SMCJ43A     | SMCJ43CA  | GFT          | BFT | 47.8                   | 52.8   | 1           | 43             | 1                             | 69.4            | 21.6               |
| SMCJ45A     | SMCJ45CA  | GFV          | BFV | 50                     | 55.3   | 1           | 45             | 1                             | 72.7            | 20.6               |
| SMCJ48A     | SMCJ48CA  | GFX          | BFX | 53.3                   | 58.9   | 1           | 48             | 1                             | 77.4            | 19.4               |
| SMCJ51A     | SMCJ51CA  | GFZ          | BFZ | 56.7                   | 62.7   | 1           | 51             | 1                             | 82.4            | 18.2               |
| SMCJ54A     | SMCJ54CA  | GGE          | BGE | 60                     | 66.3   | 1           | 54             | 1                             | 87.1            | 17.2               |
| SMCJ58A     | SMCJ58CA  | GGG          | BGG | 64.4                   | 71.2   | 1           | 58             | 1                             | 93.6            | 16                 |
| SMCJ60A     | SMCJ60CA  | GGK          | BGK | 66.7                   | 73.7   | 1           | 60             | 1                             | 96.8            | 15.5               |
| SMCJ64A     | SMCJ64CA  | GGM          | BGM | 71.1                   | 78.6   | 1           | 64             | 1                             | 103             | 14.6               |

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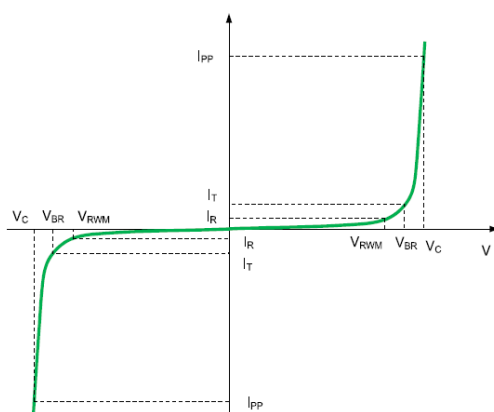
● Surface Mount ● 1500W

| Part Number |           | Part Marking |     | $V_{BR}^{(1)}$ @ $I_T$ |        | $I_T^{(2)}$ | $V_{RM}^{(3)}$ | $Max I_R^{(4)}$ @ $V_{RM}$ | $Max V_C^{(5)}$ | $Max I_{PP}^{(6)}$ |
|-------------|-----------|--------------|-----|------------------------|--------|-------------|----------------|----------------------------|-----------------|--------------------|
| Uni         | Bi        | Uni          | Bi  | MIN(V)                 | MAX(V) | mA          | V              | $\mu A$                    | V               | A                  |
| SMCJ70A     | SMCJ70CA  | GGP          | BGP | 77.8                   | 86     | 1           | 70             | 1                          | 113             | 13.3               |
| SMCJ75A     | SMCJ75CA  | GGR          | BGR | 83.3                   | 92.1   | 1           | 75             | 1                          | 121             | 12.4               |
| SMCJ78A     | SMCJ78CA  | GGT          | BGT | 86.7                   | 95.8   | 1           | 78             | 1                          | 126             | 11.9               |
| SMCJ85A     | SMCJ85CA  | GGV          | BGV | 94.4                   | 104    | 1           | 85             | 1                          | 137             | 10.9               |
| SMCJ90A     | SMCJ90CA  | GGX          | BGX | 100                    | 111    | 1           | 90             | 1                          | 146             | 10.3               |
| SMCJ100A    | SMCJ100CA | GGZ          | BGZ | 111                    | 123    | 1           | 100            | 1                          | 162             | 9.3                |
| SMCJ110A    | SMCJ110CA | GHE          | BHE | 122                    | 135    | 1           | 110            | 1                          | 177             | 8.5                |
| SMCJ120A    | SMCJ120CA | GHG          | BHG | 133                    | 147    | 1           | 120            | 1                          | 193             | 7.8                |
| SMCJ130A    | SMCJ130CA | GHK          | BHK | 144                    | 159    | 1           | 130            | 1                          | 209             | 7.2                |
| SMCJ150A    | SMCJ150CA | GHM          | BHM | 167                    | 185    | 1           | 150            | 1                          | 243             | 6.2                |
| SMCJ160A    | SMCJ160CA | GHP          | BHP | 178                    | 197    | 1           | 160            | 1                          | 259             | 5.8                |
| SMCJ170A    | SMCJ170CA | GHR          | BHR | 189                    | 209    | 1           | 170            | 1                          | 275             | 5.5                |
| SMCJ188A    | SMCJ188CA | GHT          | BHT | 209                    | 222    | 1           | 188            | 1                          | 292             | 5.1                |
| SMCJ200A    | SMCJ200CA | GHV          | BHV | 224                    | 247    | 1           | 200            | 1                          | 324             | 4.6                |
| SMCJ220A    | SMCJ220CA | GHX          | BHX | 246                    | 272    | 1           | 220            | 1                          | 356             | 4.2                |
| SMCJ250A    | SMCJ250CA | GJG          | BJG | 278                    | 309    | 1           | 250            | 1                          | 403             | 3.7                |
| SMCJ300A    | SMCJ300CA | GJH          | BJH | 333                    | 371    | 1           | 300            | 1                          | 484             | 3.1                |
| SMCJ350A    | SMCJ350CA | GJM          | BJM | 389                    | 432    | 1           | 350            | 1                          | 565             | 2.7                |
| SMCJ400A    | SMCJ400CA | GJP          | BJP | 444                    | 494    | 1           | 400            | 1                          | 645             | 2.3                |
| SMCJ440A    | SMCJ440CA | GJR          | BJR | 489                    | 543    | 1           | 440            | 1                          | 710             | 2.1                |

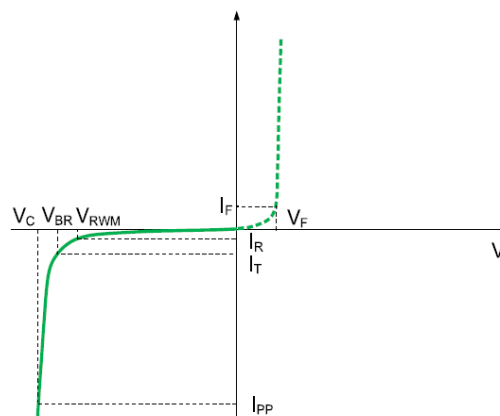
For bidirectional type having  $V_R$  of 10 volts and less, the  $I_R$  limit is double.

### I-V Curve Characteristics

Bidirectional



Unidirectional



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| Symbol       | Parameter                                 | Explanation                                                                                |
|--------------|-------------------------------------------|--------------------------------------------------------------------------------------------|
| (1) $V_{BR}$ | <b>Breakdown voltage</b>                  | The Voltage that flows though the TVS at a specified test current ( $I_T$ )                |
| (2) $I_T$    | <b>Test current</b>                       | A specified test current that flows though the TVS                                         |
| (3) $V_{RM}$ | <b>Stand-off voltage</b>                  | Maximum voltage that can be applied to the TVS without operation                           |
| (4) $I_R$    | <b>Leakage current @ <math>V_R</math></b> | Current measured at $V_R$                                                                  |
| (5) $V_C$    | <b>Clamping voltage</b>                   | Peak voltage measured across the suppressor at a specified $I_{PP}$ (peak impulse current) |
| (6) $I_{PP}$ | <b>Peak pulse current</b>                 | The maximum surge current that flows though the TVS                                        |

Fig1. Pulse Waveform

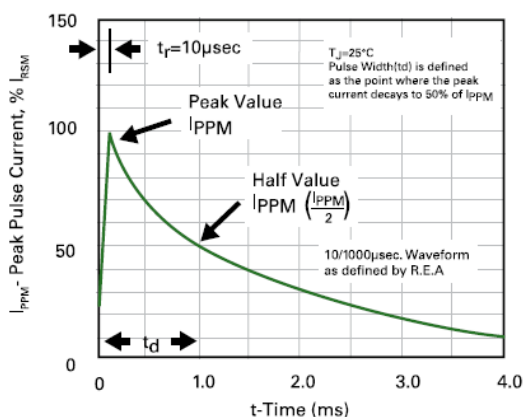


Fig2. Pulse Derating Curve

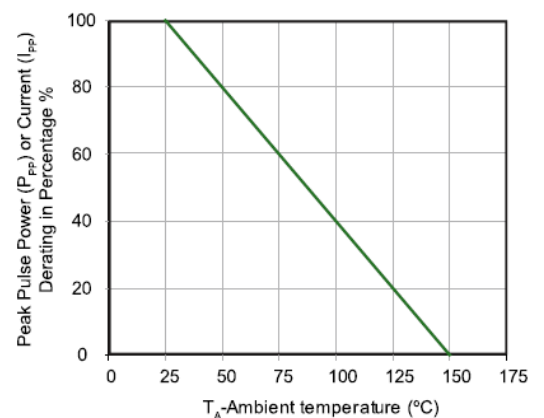


Figure 3. Steady Power Dissipation Derating Curve

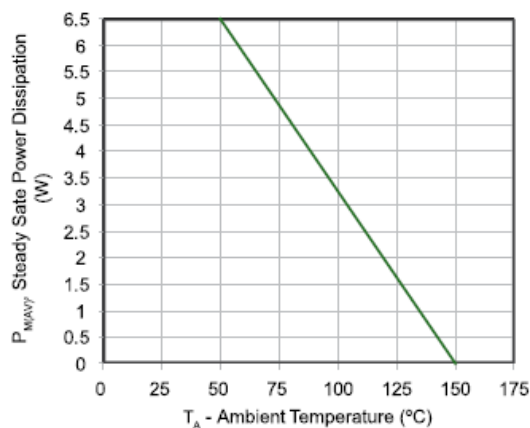
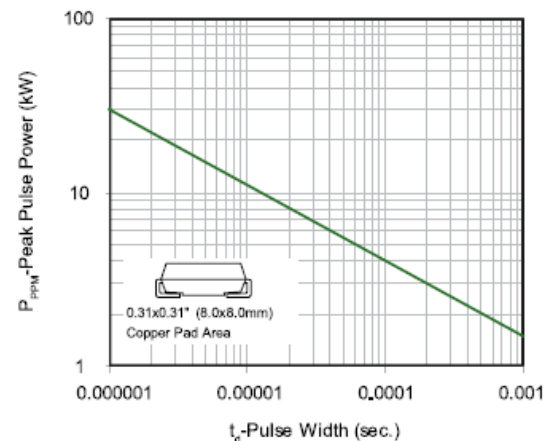


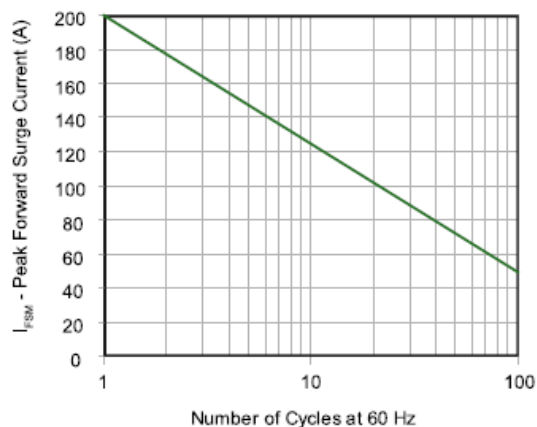
Figure 4. Peak Pulse Power Rating Curve



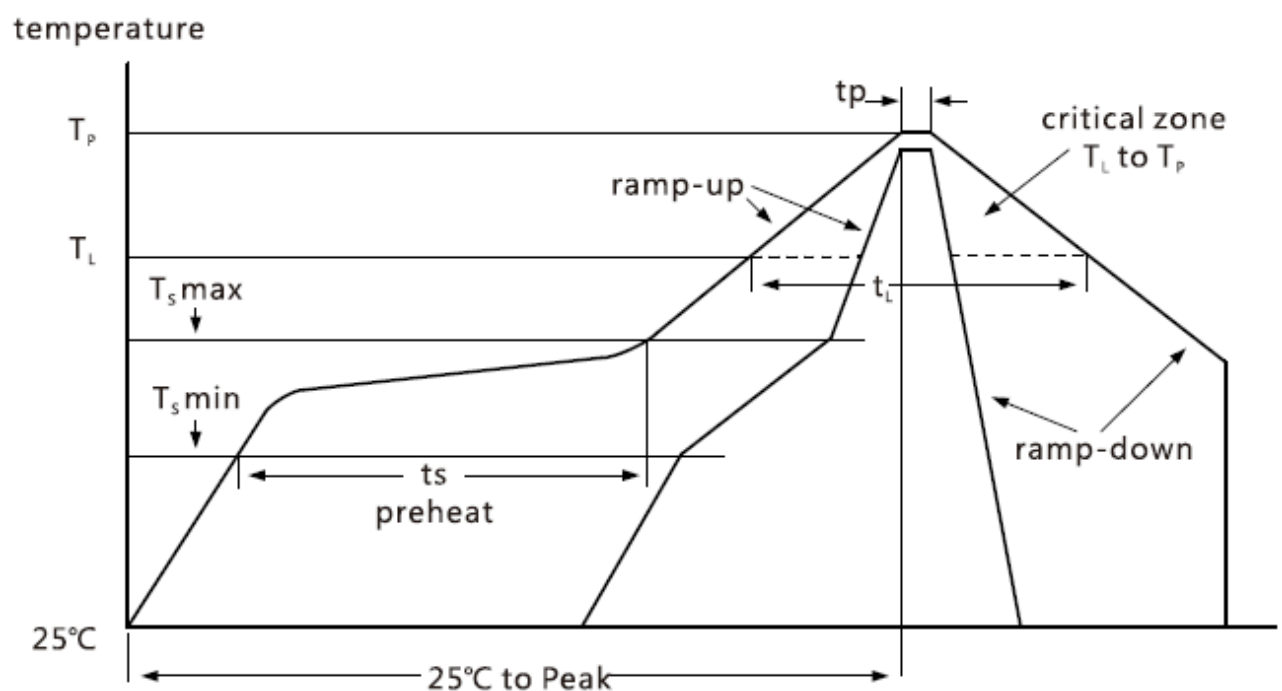
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Figure 5. Maximum Non-Repetitive Surge Current



## Reflow Soldering Profile

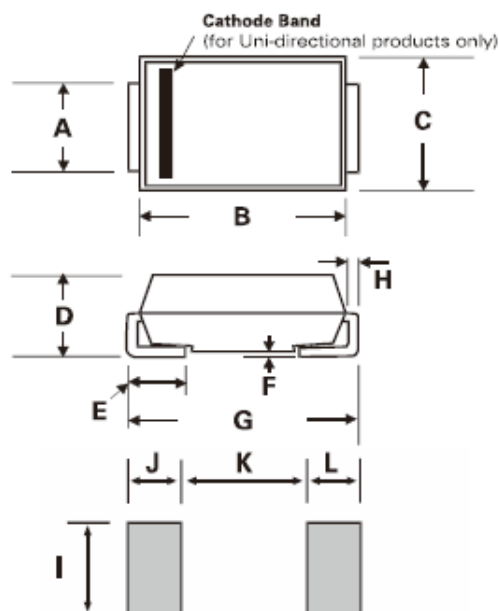


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| Reflow Profile Feature                                | SnPb eutectic assembly | Pb-free assembly  |
|-------------------------------------------------------|------------------------|-------------------|
| Average ramp-up rate ( $T_{smax}$ to $T_p$ )          | 3°C/s maximum          | 3°C/s maximum     |
| Preheat                                               |                        |                   |
| Temperature minimum ( $T_{smin}$ )                    | 100°C                  | 150°C             |
| Temperature maximum ( $T_{smax}$ )                    | 150°C                  | 200°C             |
| Time ( $T_{smin}$ to $T_{smax}$ )                     | 60 s to 120 s          | 60 s to 180 s     |
| Time maintained above                                 |                        |                   |
| Temperature ( $T_L$ )                                 | 183°C                  | 217°C             |
| Time ( $t_L$ )                                        | 60 s to 150 s          | 60 s to 150 s     |
| Peak/classification temperature ( $T_p$ )             | 235°C                  | 260°C             |
| Number of allowed reflow cycles                       | 3                      | 3                 |
| Time within 5 °C of actual peak temperature ( $t_p$ ) | 10 s to 30 s           | 10 s to 30 s      |
| Ramp-down rate                                        | 6°C/s maximum          | 6°C/s maximum     |
| Time 25 °C to peak temperature                        | 6 minutes maximum      | 8 minutes maximum |

## Package and Layout Dimensions (DO-214AB / SMC)

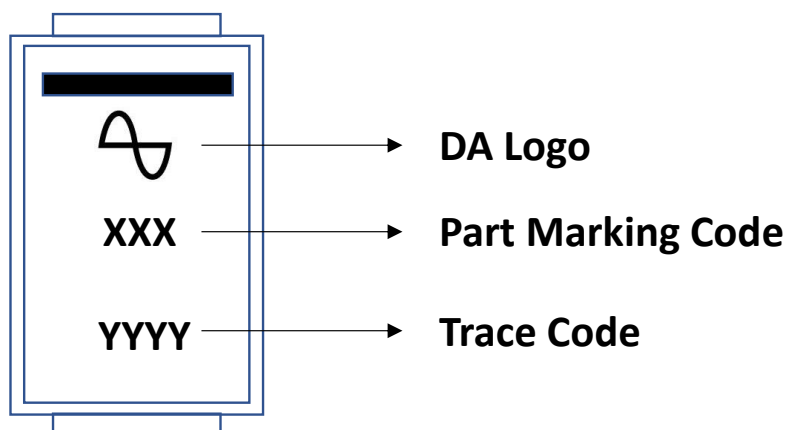


| Dimension | Inches |       | Millimeters |       |
|-----------|--------|-------|-------------|-------|
|           | Min    | Max   | Min         | Max   |
| A         | 0.11   | 0.126 | 2.8         | 3.2   |
| B         | 0.26   | 0.28  | 6.6         | 7.11  |
| C         | 0.22   | 0.245 | 5.59        | 6.22  |
| D         | 0.079  | 0.114 | 2.06        | 2.95  |
| E         | 0.03   | 0.063 | 0.76        | 1.6   |
| F         | -      | 0.008 | -           | 0.203 |
| G         | 0.305  | 0.32  | 7.75        | 8.13  |
| H         | 0.006  | 0.012 | 0.15        | 0.305 |
| I         | 0.129  | -     | 3.3         | -     |
| J         | 0.094  | -     | 2.4         | -     |
| K         | -      | 0.165 | 4.2         | -     |
| L         | 0.094  | -     | 2.4         | -     |

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### Product Marking



### Packaging

| Part          | Component Package | Quantity | Packaging Option |
|---------------|-------------------|----------|------------------|
| SMCJ-XXX-A/CA | SMC               | 500pcs   | 7"REEL           |
| SMCJ-XXX-A/CA | SMC               | 3,000pcs | 13"REEL          |